[10191/2152]

METHOD, DATA FORMAT, ENCODING DEVICE, DECODING DEVICE AND SYSTEM

[Background Information]

FIELD OF THE INVENTION

The present invention [is based on] relates to a method, a data format, an encoding device, a decoding device and a system for encoding, for decoding and/or for transmitting location information [according to the species defined in the alternative independent claims. Many].

BACKGROUND INFORMATION

It is believed that there are a number of formats for digital maps [are already known], in particular proprietary or standardized ones. An example of a standardized map is the GDF format. Moreover, it is believed that proposals have been made for the most different georeferencing methods.

[Advantages of the Invention]

SUMMARY OF THE INVENTION

[The inventive] It is believed that an exemplary method, data format, encoding device, decoding device and system [having the features of the alternative independent claims has the advantage over the background art that]according to the present invention have an advantage that may permit geographical objects of arbitrary complexity [can] to be efficiently encoded, interpreted and transmitted. In this [connection, it is ensured that] regard, geometry-oriented data and description-oriented attributes [are] may be clearly distinguished. Moreover, it is believed that this may advantageously [allows] allow map segments to be encoded, decoded and/or transmitted [as well], the map segments being geometrically open or closed, for example, in the form of meshes. [Because of this, the] Thus, geometric representations [can] may be read [out] in a single sequence, that is, "in one

piece". Furthermore, this [results] may result in [that] a division of referencings and applications [is] being attainable, i.e., the location information encoded, according to an exemplary embodiment of the present invention [is], may be optionally evaluated, [on one hand,] mainly by its geometry-oriented information[,] (i.e., in particular by its coordinate chains), the attribute-oriented description information playing a minor role or, [on the other hand] alternatively, primarily in an application-oriented manner, i.e., with respect to its attribute information.

Moreover, it is [an advantage that the]believed that an exemplary embodiment of the present invention has an advantage involving locating information that includes at least one first coordinate chain, the coordinate chain including at least one first, in particular, geographical point. [Through] In this[, it is possible for a] regard, locating information [to] may be encoded, decoded and/or transmitted with a small encoding outlay and with high accuracy.

It is [a further advantage that] believed that an exemplary embodiment of the present invention has an advantage involving the first coordinate chain [contains] containing a second point, the first point of the first coordinate chain being specified in absolute coordinates and the second point of the first coordinate chain being specified in relative coordinates, in particular with respect to a centroid coordinate or with respect to the first point of the first coordinate chain. [Through] In this[, it is possible for] regard, location information [to] may be encoded, decoded and/or transmitted [also] in the form of a serial representation along the coordinate chains. In this manner, moreover, [it is possible to attain] an efficient encoding of the locating information[, advantageously resulting] may be attained, which may result in a smaller outlay, such as, for example, less memory requirements for the encoding[, such as]

and/or smaller bandwidth requirements for the transmission[, and for the decoding.

A further advantage lies in that] and decoding.

It is believed that an exemplary embodiment of the present invention has an advantage involving the first point of the first coordinate chain [is] being interpreted in a defined direction [via], by the second point of the first coordinate chain. Thus, [a] directional information [results] may result from the serial arrangement of the plurality of points of a coordinate chain.

[Another advantage is that]It is believed that an exemplary embodiment of the present invention has an advantage involving the first point of the first coordinate chain [is] being interpreted in a defined direction [via] by the second point of the first coordinate chain. Due to the sequence of points defining a coordinate chain, [a] defined directional information is given [which] that ensues from the structure of the coordinate chain and [can] may be evaluated.

It is [also advantageous that]believed that an exemplary embodiment of the present invention has an advantage involving the description information [includes] including at least one first attribute field. [Through] In this[, it is possible for] manner, the most different kinds of other information [to] may be encoded, decoded and transmitted, in addition to the pure locating information in the form of coordinate chains.

[A further advantage consists in that] It is believed that an exemplary embodiment of the present invention has an advantage involving the first attribute field [includes] including a type specification and description data, the description data being determined by the type specification, in particular with [respected] respect to the name, accuracy, direction, time, a

POI (point of interest) and/or [to the] a physical link. In this manner, [it is also possible,] for example, [to specify an] accuracy information may be specified in a variable manner over a coordinate chain. [In] Also, in this manner, [moreover, it is possible to establish] a link between different coordinate chains may be established by providing a description type "physical link".

[With] In this[, it is also possible] regard, for example, [for] entire networks of location information [to] may be encoded, decoded and/or transmitted [via] by the inventive method, data format, encoding device, decoding device and system. In this [context] regard, such a physical link between coordinate chains [can] may correspond, for example, to a branch.

It is [likewise advantageous that]believed that an exemplary embodiment of the present invention has an advantage involving the assignment information [includes] including at least one first assignment entry, the first attribute field and the first point of the first coordinate chain being assigned to each other [via] by the first assignment entry. [Because of this] Thus, the assignment information [can advantageously] may be provided symmetrically, i.e., due to the assignment information, [it is possible to search] the location information may be searched both for coordinates or coordinate chains and for attribute fields contained in description information. Thus, the method and the data format according to an exemplary embodiment of the present invention [are] may be suitable both for geometry-oriented georeferencing methods and for attribute-oriented georeferencing methods.

[Another advantage is that]It is believed that an exemplary embodiment of the present invention has an advantage involving the first assignment entry [includes] including both a reference to the first attribute field and a reference to the

first point of the first coordinate chain. [Because of this, it is possible to establish] Thus, exactly one link may be established between a point of a coordinate chain (i.e., a so-called "chain link") and an attribute field, i.e., description data or a type specification [via] by an entry in the assignment information (reference table). By adding a further entry to the list of assignment information, i.e., to the reference table, [it is possible to establish] a further link may be established between a point of a coordinate chain and an attribute field, however, [it being required for] at least one reference may be required to be different from all other entries in the list of assignment information, i.e., either a different point from the set of locating information [is] may be referenced in the case of the further entry in the list of assignment information or a different attribute field of the description information [is referenced.]may be referenced.

[Moreover, it is an advantage that] It is believed that an exemplary embodiment of the present invention has an advantage involving the first assignment entry [includes] including either both a reference to the first attribute field and a reference to a plurality of points of coordinate chains of the locating information, or both a reference to a plurality of attribute fields and a reference to the first point of the first coordinate chain. [Due to this, it is possible for] Thus, the assignment information [to] may be simplified, [thus] thereby attaining a more compact encoding of the location information, by [carrying out] executing an appropriate grouping of entries in [the] a list of the assignment information. [This is possible, for] For example, [by combining] entries having the same attribute reference or [by combining] entries having a successive set of points within a single coordinate chain may be combined.

It is believed that an exemplary embodiment of the present invention has an advantage involving the data packet including[.

Another advantage consists in that the data packet includes] a header part of the location information and data part of the location information. This [permits] may permit a separation between pure pattern information of the whole data block and [the] information [which] that is [actually] to be encoded, decoded and/or transmitted.

[A further advantage lies in that the header part includes] It is believed that an exemplary embodiment of the present invention has an advantage involving the header part including structure information and interpreting instructions, the structure information specifying the data structure of the location information, and the interpreting instructions specifying the purpose of the location information. This [permits] may permit, in particular during the decoding of the location information, [a] faster and more efficient processing, by sorting out location information [which] that is irrelevant for a specific purpose of processing.

[Furthermore, it is an advantage that] It is believed that an exemplary embodiment of the present invention has an advantage involving the definition of at least the first point of the first coordinate chain [is] being definable as a function of a location information query. [Due to this] Thus, the location information [can] may be individually and flexibly geared to the location information query.

[Moreover, it is advantageous that]It is believed that an exemplary embodiment of the present invention has an advantage involving the location information [is] being at least partially correlatable with data of a first data base [which] that is assigned to the decoding device. This [results] may

result in an increase in the encoding efficiency of the location information because at least a part of the required location information [exists] already exists in the first data base.

It is [a further advantage that] believed that an exemplary embodiment of the present invention has an advantage involving the location information [which] that is not contained in the first data base and/or for which no correlation with data of the first data base is possible [is] being stored in a second data base assigned to the decoding device. [According to the present invention, it is thus especially possible for] Thus, the inventory of data in the first and/or the second data base may be assigned to the decoding device to be extended, updated and/or completed, which [increases] may increase the overall effectiveness of [the] an exemplary method and [of the] exemplary system, since identical queries at successive points in time, as a result of which identical location information would be transmitted [can be avoided in this manner.], may be avoided.

[Drawing]

BRIEF DESCRIPTION OF THE DRAWINGS

[An exemplary embodiment of the present invention is depicted in the drawing and will be explained in greater detail in the following description.

Figure 1 shows a] Figure 1 shows an exemplary system according to the present invention [having] including an encoding device and a decoding device for encoding, for decoding and/or for transmitting location information[;].

Figure 2 [depicts a] shows an exemplary system according to the present invention [having] including a transmitter and a receiver of location information[;].

Figure 3 [represents a] shows an exemplary system according to the present invention [having] including two transmitter-receivers of location information[;].

Figure 4 shows a data packet based on an exemplary data format according to the [inventive data format] present invention for encoding, [for] decoding and [for] transmitting location information[; and].

Figure 5 [is a representation of] shows the information content of a data packet.

[Description of the Exemplary Embodiment]
DETAILED DESCRIPTION

Figure 1 shows a system 1 according to an exemplary embodiment of the present invention for encoding, [for] decoding and/or [for] transmitting location information. System 1 [according to the present invention] includes an encoding device 20 and a decoding device 60. Encoding device 20 transmits at least one data packet 400 to decoding device 60 [via], by a transmission path. Associated with decoding device 60 is a first data base 62, decoding device 60 [drawing on] receiving data stored in first data base 62 when [decoding] it decodes data packet 400. Decoding device 60 delivers a decoding result 600, as [the] a result of the decoding of data packet 400. In [a particularly advantageous] an exemplary embodiment of the present invention, [provision can be made for] decoding result 600 [to] may be entirely or partially stored in a second data base 64 [which] that is [likewise] associated with decoding device 60. In [a further advantageous] another exemplary embodiment of the present invention, [moreover, provision is made for] the data stored in second data base 64 [to] may be utilized, together with the data stored in first data base 62, for decoding data packet 400 in decoding device 60. The optional [existence of] second data base 64 and the optional [use of the] data stored in second data base 64 for decoding data

packet 400 are represented in Figure 1 by broken arrows pointing from decoding result 600 to second data base 64 and from second data base 64 to decoding device 60, respectively.

In this [context, provision is made for] regard, the transmission path [to] may be an arbitrary transmission path. According to an exemplary embodiment of the present invention, [this will be understood both as] the transmission path may be, for example, a wire-bound [and a] or wireless transmission. [However, provision is made, in particular, to implement a] A wireless transmission of data packet 400 [via] may be implemented, for example, by a radio link. In this [context, moreover, provision is made, in particular, to use] regard, a radio link according to a standard for wireless data transmission may be used, such as , for example, DECT, GSM, UMTS, GPRS[,] or infrared. For the wireless transmission of data packet 400, [provision is made, in particular, for a] transmission [via] by an IP network may be implemented, for example, [via] transmission over the Internet.

According to an exemplary embodiment of the present invention, first data base 62 [is] may be provided, [in particular] for example, as a read-only memory, [in particular] such as a CD-ROM, magnetic tape[,] or magneto-optical disk, [or the like,] second data base 64 being provided as a rewritable memory. [However, in an advantageous] In another exemplary embodiment of the present invention, [provision can also be made for] first and second data base 62, 64 [to be] are physically combined in a single memory [which is provided,], such as, for example, [as] a write-read memory throughout or [which is provided as] a read-only memory in a first part, corresponding to a use as first data base 62, and [as] a write-read memory in a second part, corresponding to a use as second data base 64.

In system 1 [according to the present invention], [moreover, provision is made for] a third data base 22 [to be] is associated with encoding device 20. [In this context, third] Third data base 22 [is] may be either [designed as] a read-only memory or [as] a write-read memory, depending on the use of third data base 22. For [instance, if provision is made that] example, if only statistical information is required from third data base 22 for encoding data packet 400 in encoding device 20, [only statistical information is required from third] data base 22[, it can] may be [advantageous for data base 22 to be designed as] a read-only memory, for example, [as] an optical or magneto-optical disk, in particular for reasons of cost.

[On the other hand, it can be useful to provide] Alternatively, third data base 22 may be provided either entirely or partially as a write-read memory, so that current data [can] may be written [the] into the third data base, [preferably] such as, for example, at regular intervals, the current data, together with the "old data inventory", being allowed for in the encoding of data packet 400 in encoding device 20.

The cause for the encoding of data packet 400 [via] by encoding device 20 is given, according to an exemplary embodiment of the present invention, in particular in that a location information query 200 is fed to encoding device 20. However, [provision can also be made for] encoding device 20 [to] may encode data packet 400, for example, at regular intervals, and [to transmit] communicate it to decoding device 60[, it being obvious that, in]. In each case, the information content of data packet 400 [is generally] may be different in [this] the regular sequence of transmission operations.

Figure 2 [depicts] shows a system 1 according to an exemplary embodiment of the present invention, including a transmitter 5

and a receiver 10 of location information. [In this context, transmitter] Transmitter 5 transmits data packet 400 to receiver 10. [To this end, provision is made for] For this purpose, an encoding device 20 may either [to] be provided in transmitter 5, possibly with a third data base 22 associated therewith, or [for such an encoding device 20 to] be assigned to transmitter 5. Accordingly, [provision is made for] a decoding device 60 [according to the present invention to be] is either integrated in or assigned to receiver 10. In these two cases, decoding device 60 [according to the present invention then] may optionally [includes] include first data base 62 and/or second data base 64.

[In Figure 2, transmitter 5 can] Transmitter 5 may represent, for example, a service provider who transmits data packet 400 to [the] users of a corresponding service [in the form of] by a broadcast transmission. In this case, receiver 10 [constitutes such] represents a user of [a] the service made available by the service provider. [The mentioned services] Services may include, [in particular] for example, navigation and/or traffic information services. According to an exemplary embodiment of the present invention, location information receiver 10 [depicted in Figure 2, in particular as], which may represent a user of a service that either requires or provides the transmission of location information, [is in particular] may be a land vehicle or watercraft, or a user who needs [a] location information.

Figure 3 shows system 1 according to an exemplary embodiment of the present invention, including a first transmitter-receiver 6 and a second transmitter-receiver 7. [In this context, provision is made in Figure 3 for both the] The first transmitter-receiver [to transmit] transmits information in the form of data packet 400 to second transmitter-receiver 7 and [for] the second transmitter-receiver 7 [to transmit] transmits information in

the form of data packet 400 to first transmitter-receiver 6. [Of course, the] The information content of the respective data packets 400 [is generally] may be different, depending on whether data packet 400 is transmitted from the first transmitter-receiver to the second transmitter-receiver or vice versa.

In an exemplary embodiment according to the present invention, second transmitter-receiver 7 is [designed as] a motor vehicle [which] that needs [a] specific navigation or traffic telematics [service] services, so that location information, for example, [on] the most favorable traffic route [to be selected] in a given traffic jam or traffic flow situation in the affected road network [is needed], may be required by second transmitter-receiver 7. [To] For this [end] purpose, second transmitter-receiver 7 transmits data in the form of data packet 400 to first transmitter-receiver 6, which [is designed] may be, for example, [as] a service provider for navigation or traffic telematics services. Data packet 400 received by first transmitter-receiver 6 [contains] may contain, for example, [a] location information on the starting and [the] destination [position] positions of second transmitter-receiver 7. Subsequently, data is encoded, which is [transmitted] transmited from first transmitter-receiver 6 to second transmitter-receiver 7 as data packet 400, this data packet 400 containing the routing [which] that is most favorable at the time of encoding.

[As a further application case] According to another exemplary embodiment of the present invention, [provision is made that] a user, [via] by a navigation system, places a query with a service provider, regarding the nearest parking garage, since the data base [which] that is available to the user, for example, in the navigation system, [does] may not provide [any] information on parking garages. [To] For this [end,] purpose, the [user's] user's own position is transmitted to

the service provider. [According to the present invention, this own position is] This position may be ascertained from the data base of the navigation system on the user side, but [can] may also be determined, for example, via GPS (global positioning system). The service provider transmits data packet 400 to the user, the data packet [having an] including information content [which] that enables the navigation system on the user side to find the parking garage. [According to the present invention, it is possible in this connection, on one hand, to send information] Information may be sent to the service provider [about] concerning which navigation system and [which] data base (in particular, which update status) are present on the user side [and, on the other hand, provision is also made according to the present invention that]. Alternatively, if such [an] information [is] may not [made available] be communicated to the service provider [and that], during the encoding of data packet 400, useful assumptions [are] may be made [on] concerning the data content of the data base or [on] the navigation system of the user.

[In] According to Figure 3, [thus, provision is made that both] first transmitter-receiver 6 and second transmitter-receiver 7 each contain an encoding device 20 and a decoding device 60, possibly with data bases 22, 62, 64[,] assigned for this purpose. In this [context] regard, encoding device 20 of second transmitter-receiver 7 initially encodes data packet 400 [which] that is transmitted from second transmitter-receiver 7 to first second transmitter-receiver 6. This data packet 400 is decoded in first transmitter-receiver 6 in decoding device 60 thereof, and is translated into location information query 200 [which] that is thereupon made available to encoding device 20 of first transmitter-receiver 6. Data packet 400 to be transmitted from first transmitter-receiver 6 to second transmitter-receiver 7 is then encoded by encoding device 20 of first transmitter-receiver 6 and, after being transmitted to second

transmitter-receiver 7, is decoded by decoding device 60 thereof, whereupon decoding device 60 of second transmitter-receiver 7 holds decoding result 600 [ready] for further use, for example, for display or storage.

Figure 4 [represents the] shows an exemplary structure of data [packet] packets 400. [The] An exemplary data format according [to] the present invention for coding, decoding and transmitting location information uses [such] data packets 400 for the transmission of the location information. Data packet 400 is divided into a header part 420 and a data part 440. Header part 420 includes, on its part structure, information 422 and[, possible,] may also include interpreting instructions 424. Header part 420 is also denoted as header 420. The data structure of data packet 400 is specified in header 420 [via] by structure information 422. The structural interpretation [is] may be ensured in this manner.

Interpretation instructions 424 [serve to] may allow the data [contents delivered in] content of data packet 400 to be correctly interpreted [as such. To this end, it is useful to furnish]. For this purpose, a statement on the purpose of the data content may be furnished. Information [content. Useful at this point is, for instance, an information] on whether the information content of data packet 400 is, for example, a subnetwork of a digital map, a POI (point of interest)[,] or a traffic jam warning[, etc] may be furnished. The purpose of the data content of data packet 400 [can] may be indicated, [in particular, via] for example, by a type catalog, so that [the] different possible data contents [can] may unequivocally be recognized.

Data part 440 of data packet 400 is [always] divided into locating information 450, description information 470, and assignment information 460. In this [connection, provision is made according to the present invention that] regard, locating

information 450 and description information 470 [be] are present or transmitted within data packet 400 separately from each other, [i.e.,] such as, for [instance] example, during the transmission of data packet 400 [and, here in particularly of data part 440, for]. For example, locating information 450 [is] may be transmitted first, [then] followed by description information 470 and[, after that,] then assignment information 460 [or]. Or, these three information types [are] may be transmitted in a different order, but not [in a manner] such that they are mixed among themselves.

Locating information 450 includes an arbitrary number of coordinate chains, [for] which are [representatively indicated] represented in Figure 4 as a first coordinate chain 451 and a second coordinate chain 452. Specifically, [provision is also made for] locating information 450 [to] does not include any coordinate chains 451, 452 and, consequently, [that] data part 440 of respective data packet 400 does not include any locating information 450. [On their part, coordinate] Coordinate chains 451, 452 include an arbitrary number of points[,]: a first point 454 of first coordinate chain 451[,]; a second point 455 of first coordinate chain 451; and a third point 456 of first coordinate chain 451 [being representatively indicated for], which is representative of the arbitrary number of points [for] of first coordinate chain 451. Correspondingly, a first point 457 of second coordinate chain 452, a second point 458 of second coordinate chain 452 and a third point 459 of second coordinate chain 452 [are representatively indicated for] represent the arbitrary number of points of second coordinate chain 452. In particular, [provision is made for] a coordinate chain [to include] includes only one point.

[A] In an exemplary embodiment according to the present invention, directional information is given [via] by the sequence of the points in coordinate chains 451, 452. The

points of a coordinate chain generally denote a geographical point, this point generally being defined by coordinate data with respect to a coordinate network, for example, on the surface of the earth. In this [connection provision is made according to the present invention, in particular that, for increasing] regard, the encoding efficiency may be increased, for example, by first point 454 [be] being specified in absolute coordinates for first coordinate chain 451 and [that] following points 455, 456 [be] being specified only with relative coordinates with respect to first point 454. [Another way is to specify] Alternatively, a point of a coordinate chain may be specified by the difference coordinate to its preceding point, i.e., to specify the differential vector between the preceding point and the point to be defined. Moreover, [it is also possible to generate] a centroid coordinate for a coordinate chain may be generated, the centroid coordinate being specified in absolute coordinates, and [to define] the points relative to the centroid coordinate may be defined.

Description information 470 includes an arbitrary number of attribute fields [for], which are [representatively indicated] represented in Figure 4 as a first attribute field 471, a second attribute field 472, and a third attribute field 473. [Provision can also be made for description] Description information 470 [to] may not include any attribute fields, so that data part 440 of respective data packet 400 does not include any description information 470. First attribute field 471 includes a type specification 474 of first attribute field 471 and description data 475 of first attribute field 471. Second attribute field 472 likewise includes a type specification 476 of the second attribute field and description data 474 of second attribute field 472. [In the same way] Similarly, third attribute field 473 includes a type specification 478 of the third attribute field and description data 479 of the third attribute field. Type specifications

374, 476, 478 specify the type of information [which] that is contained in the respective attribute fields 471, 472, 473. According to an exemplary embodiment of the present invention, this [can] information may be a name, a directional accuracy, a time, a POI (point of interest) and/or a physical link. The description data 475, 477, 479 is then the information [which] that corresponds to the respective type specification.

[For instance] In an exemplary embodiment of the present invention, description data 475, 477, 479 [contains] may contain the indication of a time in an appropriate data format, if corresponding type specification 474, 476, 478 contains the type of a time indication.

Further examples of description data 475, 477, 479 or type specification 474, 476, 478 include:

- "is desired object": an interpretation aid was already given in header part 420. The object [which] that is actually to be referenced (i.e., one or a plurality of geometrical point(s) 454 to 459) [can] may be explicitly marked as such [as well].
- Objects are marked by their "possible use". Encoded for an object in description information 470 of data packet 400 is, for [instance, the] example, information indicating that [this] the object [can] may be utilized only for representation, but not for matching, that is, for the correlation with data of a data base.
- Preferred points [which a] that are deemed to be important on the transmitter side should be markable as such.
- [Provision is made for crossing] Crossing points in a network of a digital map [to] may be treated either as a physical link or as a further category of the type "crossing".

Assignment information 460 includes an arbitrary number of assignment entries, [for] which are [representatively indicated] represented in Figure 4 as a first assignment entry 461 and a second assignment [application] entry 462. In particular, [provision can also be made for] assignment information 460 [to] may not include any assignment entries, so that data part 440 of the respective data packet does not include any assignment information 460. According to an exemplary embodiment of the present invention, assignment information 460 [can] may be represented[, in particular] in the form of a table. In this [context] regard, each assignment entry includes a reference both to a point 454 to 459 and to an attribute field 471, 472, 473. In this manner, a link [is] may be established in the form of an assignment between a point 454 to 459 of a coordinate chain 451, 452 and the data of an attribute field 471, 472, 473. In this [connection, according to the present invention] manner, it is provided, permitted both that by an assignment entry 461, 462 a link [be] is established between exactly one point 454 to 459 and exactly one attribute field 471 to 473 and it is also permitted that an assignment between a number of several points 454 to 459 and exactly one attribute field 471 to 473 or else between exactly one point 454 to 459 and a number of several attribute fields 471 to 473 [be permitted. Due to this] is established. As a result, the encoding efficiency [is] may be increased. This [is] may be given[, in particular,] by the mentioned combination of assignment entries [which have] having the feature that the information content of their attribute field is identical or [which have the feature] that they refer to successive points. By grouping such "single assignment entries" into a single "group assignment entry", [it is possible to attain a compression.]a compression may be attained.

[A] In an exemplary embodiment of the present invention, a reference to a point 454 to 459 of a coordinate chain 451, 452

[is advantageously possible] may be made, by specifying the number of coordinate chain 451, 452 and the list position of point 454 to 459 within the chain. [According to the present invention, the] The reference to an attribute field is correspondingly given [via] by its number or list position [in an advantageous manner. Via]. By assignment entries 461, 462, assignment information 460 is [designed as] a cross-referencing, which [can advantageously] may be represented in tabular form.

[If] According to an exemplary embodiment of the present invention, if both locating information 450 and assignment information 460, as well as description information 470, do not contain any entries, respectively, data part 440 of respective data packet 400 is empty[, which is also provided for by the present invention. In this case, this fact is]. This fact may be encoded in header part 420 of data packet 400. In this [context] regard, structure information 422 of header part 420 may contain, for example, data with respect to the length (for example, in bytes) of header part 420, data on the length (for example, in bytes) of interpreting instruction 422 of header part 420, data on the number of coordinate chains 451, 452 within locating information 450, and data on the number of points contained in each of the coordinate chains, data on the number of assignment entries 461, 462 within the assignment information 460 and data on the number and the respective length (for example, in bytes) of attribute fields 471 through 473 of description information 470. [Via] By this data structure [data] in header part 420, with respect to data part 440 of data packet 400, [it is also possible to separately access] individual information types of data part 440 may be separately accessed.

Figure 5 [is a representation of] shows the information content of a data packet 400. First coordinate chain 451 includes a number of points, which are framed in Figure 5 by a

first frame of broken lines [which is provided with reference numeral 451]. Included among the points of first coordinate chain 451 is[, first of all,] first point 454 of first coordinate chain 451, an arrow pointing from the first point to the second point (not marked) of first coordinate chain 451. From the second point of first coordinate chain 451, in turn, an arrow points to third point 456 of first coordinate chain 451, and from there to a fourth point (not marked) of coordinate chain 451, and so on. At third point 456 of first coordinate chain 451, second coordinate chain 452 branches off, the points thereof being framed in Figure 5 by a second frame of broken lines [which is provided with reference numeral 452]. From first point 457 of second coordinate chain 452, in turn, an arrow points to the second point (not marked) of second coordinate chain 452, and from there further to the third point (not marked) of second coordinate chain 452. From the third point of second coordinate chain 452, an arrow points to a fourth point of second coordinate chain 452, the fourth point, in the [example] exemplary embodiment, at the same time being the last point of second coordinate chain 452 and indicating, for [instance] example, a department store, a parking garage or, in more general terms, a POI (point of interest).

[In the example shown in] The exemplary embodiment of Figure 5[,] shows third point 456 of first coordinate chain 451 and first point 457 of second coordinate chain 452 [mark] marking the same geographical point. Thus, a physical link [is] may be established between these two points. The information on the physical link is stored in description information 470 of data packet 400 and is assigned to the two mentioned points 456, 457 [via] by assignment information 460 of the data packet as described above. In this manner, [it is possible, in particular, to encode, decode and transmit entire networks]entire networks, which correspond to digital maps, [using

the] may be encoded, decoded and transmitted, using an exemplary data format according to the present invention.

The encoding of data packet 400 [will] may be [understood especially as]:

- the provision of the actual object, i.e., of the object [which] that is requested especially [via] by location information query 200, with a corresponding environment of locating or description information [via] by a suitable retrieval, that is, [via] by a correlation with the data of the data base on third data base 22;
- the transfer of the geometry representing this data into a suitable set of coordinate chains 451, 452 or, more generally, to a suitable set of location information 450;
- the transfer of relevant identifiers from third data base 22 into format-compliant attribute fields 471, 472, 473;
- the marking of relevant parts [()](such as, for example, "is desired object", POl);
- the generation of assignment information 460, in particular in the form of a cross-reference table;
- the generation of header 420 and data part 440.

In [a simpler] another exemplary embodiment[, however, the] of the present invention, the encoding [can also] may include only a part of these steps. [This is]It is believed that this may provide an advantage[, in particular, where] when data packets 400 have to be encoded, which are just standard ones or intended for a very specific purpose [of] or application. This [could be the case where] may occur when a user, for example, in a motor vehicle, interrogates traffic information with respect to a route to be traveled [Here, it is]. It may be sufficient, during the encoding of data packet 400 [which] that is to be transmitted from the user to a service provider, for example, [via] by mobile telephony, [to make provision] for data packet 400 to transmit only the starting and destination coordinates along with the information [that]

indicating whether the coordinates are starting [and] or destination coordinates.

The decoding of data packet 400 [will] may be [understood especially as]:

- a comparison of the geometrical information contained in data packet 400 with the data content of first data base 62 and/or second data base 64 in connection with which, in particular, suitable correlation methods (matching) [are] may be used, resulting in a set of references to first and second data base 62, 64 associated with decoding device 60.

According to an exemplary embodiment of the present invention[, provision is also made, in particular]:

- [to carry out] a geometrical consistency check for geometrical objects, which are possibly to be newly connected , may be performed;
- [to carry out] a retrieval on first and/or second data base 62, 64 along the lines of string comparisons may be performed, using the attributes existing, in particular, in description information 470 of the data packet, referenced to these data bases being expected as the result again;
- [to carry out] a crosswise check of the consistency between geometry-oriented information and description-oriented information [via] may be performed by assignment information 460 of data packet 400;
- [to store in second data base 64] geometry-oriented and/or description-oriented information may be stored in second data base 64, in particular, objects to be newly connected together with the references.

[Abstract]

ABSTRACT OF THE DISCLOSURE

[Proposed is a] A method, a data format, an encoding device, a decoding device and a system for encoding, for decoding and/or for transmitting location information, the location information including both locating information [(450)] and description information[(470)], a data packet [(400)] separately containing locating information [(450)] and description information[(470);], and the data packet [(400)] containing assignment information [(460)] for assigning at least a part of the locating information [(450)] to at least a part of the description information[(470)].

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